SUPPLEMENT.

The Mining Journal,

RAILWAY AND COMMERCIAL GAZETTE:

FORMING A COMPLETE RECORD OF THE PROCEEDINGS OF ALL PUBLIC COMPANIES.

No. 1713.—Vol. XXXVIII. LONDON, SATURDAY, JUNE 20, 1868. {STAMPED .. SIXPENCE. UNSTAMPED, FIVEPENCE.

Original Correspondence.

THE SHROPSHIRE COAL FIELD—No. VIII.

FORMATION AND DENUDATION OF STRATA.

SIR,—In the present state of geological knowledge it is impossible to give even a proximate guess at the extent to which successive beds of the minerals we now so much covet have been destroyed: and the more so, seeing that it is not yet clear to what extent the various coal fields of this country were originally connected. Looking at the immense accumulations of vegetable matter necessary to produce a succession of seams, such as are found in one of these coal fields—to say nothing of the differences as to number or thickness, or of the changes which sometimes take place in intervening strata—it is not surprising that each field should have been regarded as distinct and independent. But now that a more careful study has been made of the animal and vegetable remains they contain, and a closer resemblance of species and genera, often bearing little resemblance to others in preceding or succeeding strata, has been found to exist in seams of coal and ironstone over wide areas—and now that we know that towards the close of the Devonian and during the carboniferous periods the extent of land above the sea was so increasing that the same species lived on under similar conditions over half the globe, and that on tracts a little above the water the same plants grew, we can better understand how those coal fields now found in isolated tracts might have extended over much wider areas. That the Shropshire and South Staffordshire coal fields are but fragments of one great mineral tract, would appear from the position which that most important and persistent measure—the pennystone ironstone—occupies in the two fields, as well as from the similarity of its organic remains. The authors of the Memoirs of the Geological Survey, in their "Iron Ores of Great Britain," say that the lower beds of the coal measures in South Wales and Shropshire (and the same is true for Lancashire) contain a set of marine fossils, some of which are mountain limestone species, and the rest peculiar to the coal measures. Also that there seem to be good reasons for supposing the Rosser veins of South Wales equivalent to the Pennystone and underlying ironstones of Coalbrookdale, that the Flat Coal Bass has at least a very strong resemblance in its fish remains to the Bottom vein, and that the Darran Pins exactly resemble the White Flats of Coalbrookdale, whilst the Eiled Balls Mine is the counterpart of the Ballstone of the same field. If the various beds of these coal fields can be correlated, and if it is reasonable to suppose that the mineral seams originally extended over the greater portion of the intermediate tracts, where we know they no longer exist, the extent to which they have been denuded is amazing.

Mr. Jukes, speaking of the coal measures in the South of Ireland, lying in hollows of carboniferous limestone, says—"The escarpments of these widely separated tracts of the coal measures are so similar, and the beds composing them so precisely alike, that it is impossible to suppose otherwise than that they originally formed continuous sheets of rock, although they are now separated by 60 or 80 miles of ground, composed of undulating beds of rock, that lie beneath the coal measures." He then shows how denudation has in those intermediate tracts cut away from 4000 to 8000 ft. of coal measures, 3000 ft. of carboniferous limestone, and then eaten even deep into the Lower Silurian rocks themselves.

The Coalbrookdale coal field presents evidences of denudation at two or three periods. We have already alluded to the extent to which the Upper Silurians had been cut down prior to the lower coal measures; supposing, also, that the millstone grit had been deposited anything like equally over the entire field, the present inequality would lead us to suppose that 100 feet at least had in places been removed. In places, for instance, where it approaches the carboniferous limestone, in the direction of the Wrekin, it is 150 feet in thickness, and it decreases to 120 ft. between the Lawley and Steeraway; it is 80 ft. thick near the Deep Field Pit, not far from Dawley, whilst at Lincoln Hill it decreases to some 20 feet, and in other places is scarcely represented at all. Again, when we leave the lower coals, evidences of denudation present themselves; and in open quarries and on valley sides old denuded cliffs are seen overlaid by newer strata. Denudation in some of these instances was partial, the result, probably, of some difference of level, caused by local disturbance. This would appear from the appearance of the Rough Rock, in a clay quarry at Lightmoor, where a conglomerate occurs in denuded strata, containing fragments of coal, ironstone, shale, and basalt. Mr. Scott also mentions an instance in which a surface at one time existed between the Pudley-hill Pit and the Wharf Pit, at Malinslee: from the top of the double coal rock to the top of the ballstone clod, being an inclination of 1 in 50, on which denuded surface the strata from the ballstone-clod to the calaminker were subsequently deposited, and again washed away down to the flint rock at the Grange Pit, beneath which the pennystone and sulphur coal had previously been destroyed by similar means, leaving the flint coal rock to rest upon the upper clunches.

In speaking of the evidences of denudation found in the Shropshire coal field, we have already shown that the measures run out or disappear one after the other, the lower one reaching farthest, whilst some of the very lowest have escaped altogether in the north and north-eastern portions of the field. Mr. Scott shows that the distance from where the "top coal" is first cut off, near Malinslee Hall, to that where the clod coal (150 feet below) disappears to the south-east, is nearly a mile; thus indicating a gradual slope, such as a body of water acting upon strata with a slight dip to the east might be supposed to present. The appearance of the coal at the point where it disappears is evidence of the nature of the destroying agency; it shows indications of having been water-worn, its lamina are separated, and the interstices filled with foreign matter. Portions also of the coal and of the adjoining rocks, or shale, are torn off and rounded, showing that they have been the sport of waves or currents, whilst over the edges of the denuded strata is spread a rough, gritty rock, made up of fragments of other rocks, called calaminker. Thus the top coal is cut off at a point about 2100 yards north of the Grange Pit, the double coal (28 feet below the top coal) at about 1100 yards, the yard coal (8 feet below the double coal) at about 770 yards, and the big flint coal (25 ft. 9 in. below the yard coal) at about 440 yards. In the Madeley Wood Company's field, and at the Shaw Field Pit, still further south, the Randle coal (63 feet below), is found to disappear east of the shaft; at the Deep Pit, Broseley, the clod coal, still lower down, is denuded; and, finally, still more south, the whole of the coal measures, millstone grit, and all, have been swept away, and two or three inferior coal seams have subsequently been formed in their stead, upon the denuded edges of the older rocks, with a singular bed of limestone between.

JOHN RANDALL, F.G.S.

THE NORTH STAFFORDSHIRE COAL FIELD—No. III.

SIR,—The method of working the coal and ventilating the workings was described in the letter published in last week's Journal. The Nos. 1 and 2 pits are 53 yards apart, from centre to centre, 163 yards and 150 yards deep respectively.

ENGINES AND BOILERS.—The winding and pumping-engines placed on them may be taken as a type of many others erected in North Staffordshire, though there are several of larger size. The winding-engine is placed between the pits, is of 21-in. horizontal cylinder, 4½ ft. stroke, enclosed in a brick house. The spur wheels are 2 to 1 in. in diameter, the drum is 8 and 9 ft. diameter, with 3¼-in. round iron wire-rope; these are outside the house. There are two boilers, 34 ft. by 5 ft. each, one only being in use at a time; two safety-valves and one float to each boiler, and a steam-pressure gauge in the engine-house. The pumping-engine, on the opposite side of No. 1 pit, is 24-in. cylinder, 4 ft. stroke, beam engine, supported on pillars in a brick house. The spur wheels, 3 to 1 in. diameter, and long wood connecting rods, are outside, giving motion to the pump rods by means of two T-bobs: there are two bucket lifts from the bottom to near the top of No. 1 pit, each 11½ in. diameter. There are two boilers for this engine, 38 by 5½ ft. each, with fittings similar to the other boilers. The boilers are all plain cylindrical ones, fired externally at one end, with flash flues to the chimney. This pumping-engine, in construction, is similar to many others in this coal field; a larger engine, with the beam projecting over the pit, would probably be a greater first cost, but the friction and liability to breakage of the spur wheels and connecting rods would be dispensed with, and a constant saving of steam thereby effected. There are two large pumping-engines at Kidsgrove Ironworks, which are exceptions to this rule, one being a 62-in. cylinder beam engine, which works four bucket lifts direct from the beam; the two upper lifts are placed in a pit under the cylinder, the piston rod projecting through the cylinder to work them; the two lower lifts are placed in the main pit, and are worked by a rod from the outer end of the beam. The other pumping engine works in a similar way to the one described, but has a crank and large fly-wheel connected to the outer end of the main pumping beam, to regulate the speed of the engine in making its up and down strokes. The class of winding engine above described is frequently used in North Staffordshire; another favourite form being a beam engine, the beam resting on the front wall of the engine-house, the spur-wheels, drums, and ropes being all outside, and exposed to the weather: it is needless to remark that, both in point of economy and safety, these should be protected from rain and damp, and a covering built over them. The boilers belonging to No. 1 and No. 2 engines were cleaned internally once a month; the water used left an incrustation at the bottom and sides, which had to be taken off with hammers. Mineral water is very objectionable for boilers, as it generally contains acids which corrode the iron, especially where any leakage occurs. Corrosion often leads to fractures and leakage, and in this state, with corrosion more active, over pressure of steam is liable to cause the boiler to explode. On changing boilers the water should not be let out before the flue and boiler has cooled down (say, 12 hours), and on re-lighting the heat should be applied gradually, so as to prevent undue straining, by subjecting the plates to sudden contraction or expansion: 20 ft. by 5 ft. is a proper size for boilers; they are of this size less subject to straining than very long ones. The furnace, it is considered, should be 4 ft. below the boiler, with a bridge (not too high) at the back of the furnace, and another bridge at the back of the boiler; this would save the plates above the furnace, and would cause the heated current to be in contact with the bottom of the boiler. The current is taken underneath, back by one side flue, and forward again by the other side to the chimney. The coal should be laid first on the front end of the furnace, and after becoming ignited moved on to the back, to make room for more. When air is admitted to the furnace heated to the same temperature as the gases evolved in combustion it will mix freely with them, and prevent the production of black smoke, which is so desirable an object to accomplish, not only in point of economy, but as a matter affecting the cleanliness and health of the towns in the pottery district. If these simple rules were adhered to the characteristic appearance of the district would be greatly changed for the better. The production of black smoke is the cause of another evil as regards boilers. The smoke becoming deposited on the outer surface of the boiler prevents the free radiation of heat from the current; whereas when the smoke is mixed with hot air it assists in the radiation of heat, however bituminous and productive of smoke the coal may be which is used. It is necessary further to remark on this subject that careful, steady men only should have charge of engines and boilers; that the water should be maintained at its proper level in the boilers; and the safety-valves and floats require constant supervision. At collieries of any extent there is an enginewright, whose duty it is to overlook these matters, and make a daily inspection of the pit chains and ropes, and have the latter greased at proper intervals.

AIRWAYS AND PITS.—The writer having had the management of a colliery in this coal field, directed his attention, first, to measures having for their object the safety of the colliery and the works connected therewith, by enlarging the airways underground. These are often to be kept good around the outside of the goaf, or through the goaf; they gradually decrease in size, and swell up, unless attention is given to them, and are in many parts only creeping roads. Fortunately, only a moderate quantity of air is required for purposes of ventilation. It is, in many cases, better to make new airways through the goaf more frequently than to incur the expense and trouble of maintaining the old ones. A stoppage in the airways causes a cessation of the air current, where only one way is made, and accumulation of gas is the result. The pits are all 7½ ft. diameter inside, and walled with 4½-in. brickwork, without mortar; where the bricking had settled down under the curbs the bricks were quite loose; this was remedied, the buntons, or stays, were fastened, and the guide-rods put in proper guage. The cost of labour for sinking and bricking these pits is about 3*l.* per yard, which is a very moderate cost compared with other districts; the extra cost of mortar for bricking would be well repaid in the increased stability and safety given to the work.

CONTRACTS.—The working of the coal, and bringing it to surface, is usually let by contract to butty colliers, who find all the labour and, in part, materials required—as pit-wood, tools, oil, grease, candles, nails, and other timber, as the agreement may be. This system is common throughout Staffordshire, and, perhaps, originated with the numerous small pits, where an overman could not be maintained at each, and a collier was substituted, who, in addition to overlooking the other men, did part of the work himself, such as timbering and laying roads. In the absence of any machine for weighing each man's coal, this system was very likely to arise, as the butty is paid on the total tonnage sent from the colliery; he paying the men by day work, and in some cases on stint work. The tendency of the butty system is, no doubt, to economise timber and other materials, but not labour. I have found it to be a practice with them to evade making airways, and neglect the exercise of those precautions which are customary in all well-regulated collieries of other districts, such as examining places with safety-lamps before the colliers enter them, not removing accumulations of gas, or fencing off dangerous places, all which a careful overman would feel it his duty to attend to. At a few collieries in the district each collier is paid so much per ton for cutting, all his coal being weighed, and the other operations of the pit may be let by contract to deputies, roadmen, and hauliers, as the case may be.

OIL WORKS.—There are four oil works in North Staffordshire for making crude oil, which have come under the writer's observation: as they resemble each other in construction and size, a description of one of them will suffice. Cannel coal and pill is used, the latter is most productive; 1 ton of these materials produces about 30 gallons of crude oil. There are 20 gun-metal retorts, communicating each with a condenser and a cistern. Each condenser is 27 ft. long, 9 in. diameter, the products flow through this into a cistern; at the top of the whole cisterns there is a pipe allowing the escape of gas, which burns off at the top of an upright pipe. At the bottom of the cisterns the oil and water are run off into another pipe, which communicates by taps with the cisterns; from this pipe the oil and water is run into a large receptacle, the water is then run off at the bottom of it, and the oil remaining is run into tank carts, to be conveyed to the refinery: the refinery is situated near Tunstall. The whole of these works, though recently erected, are now standing. It should be observed, as having an important bearing on this subject, that an amended Act of Parliament is being introduced. The present Act forbids the sale and use of petroleum, which produces inflammable vapour when heated to 100°; the new Act will raise the standard to 110°, and will have the effect of prohibiting the sale of a large quantity of petroleum, which is stated to be of better quality, and much cheaper for illuminating purposes than the oil made from the Cannels and shales of Scotland, Staffordshire, and North Wales.

COLLIERY PLANS.—The importance of having proper plans and surveys made of colliery workings will be acknowledged by all. Managers will find it a useful and salutary practice to have surveys of workings made monthly, whereby any change in the strata or dip, or any interruption from faults, may be more correctly contended with. In these days, when a feeling greatly prevails that managers and overmen are, many of them, careless in the execution of their duties, every precaution should be taken. When colliery proprietors are assailed with being liable to compensate the sufferers for colliery accidents, it is their interest to select careful and experienced managers, and overmen will be selected for their practical knowledge of pit operations: any scientific or college training would unfit them for their duties.—*June* 16.

M. B. GARDNER.

BLASTING IN MINES—No. 1.

SIR,—The importance of rock blasting is such as to require a practical knowledge therein, in order that it may be conducted so as to ensure the most effectual results and the least amount of danger. The manner in which cavities are made in the rock to receive the blasting-powder most people who reside in mining districts are, no doubt, acquainted with. Holes are usually made in the rock, by the means of borers, of the required depth and size to receive a sufficiently large charge to split it asunder. Blasting materials may be made of different substances. Those generally in use are known to miners as blasting-powder.

As holes vary in their direction at all angles, from that of downright underfoot to right up overhead, the mode of charging can be easily understood as materially altering, according to their position and inclination. For instance, where the hole dips at a large angle the powder easily falls into it; but in cases where the holes rise other means must be resorted to to insert the charges. If the direction of the hole is right up, the method of inserting the charge is by a cartridge; if ranging near the horizontal line, the charge is usually inserted without the cartridge, by the assistance of the scoop (which is in one end of the miners' scraper), and cleverly pressed into the bottom of the hole by the assistance of the swabstick. The fuse by which the charge is ignited is usually placed in the charge, so as to ignite it about two-thirds the distance into it—namely, the charge. In other words, in case the hole requires a charge that will fill 6 inches of its length, the fuse is so inserted as to reach two-thirds the distance into it, to within 2 inches of the bottom of the hole. There is no rule, however, for the exact point of igniting the charge. I have tried experiments to ascertain the best point in the charge to be ignited, in order that the blast might rend the largest quantity of rock, and discovered that much depended on the nature of the rock, and the direction of the hole into it, as well as the relative angle of the hole to the lines of cleavage of the rock. In cases where the lamination of the rock was considerably long-grained, and the holes parallel to it, experiments have given in favour of igniting the charge towards the top end rather than near the bottom of the hole. The blasts by this mode of treatment would, it was considered, in the cases alluded to, rend a rock a greater distance beyond the bottom of the hole. That the execution of blasts vary in different kinds of rock, according to the points in which the charge is ignited, there can be little doubt; but to fix any general rule as to what the best

points are in the charge in which to bring the fire in contact, so as to produce the best results, is, notwithstanding, a very difficult matter, and can best be determined by actual experiment and experience, as the nature and qualities of one kind of rock require different treatment from those of another.

The fuses that have been in use to ignite the blasts have been of a very varied material, particularly those used in mines, to describe the whole of which would be a difficult task. The following are a few of them. Before the invention of the well-known fuse of Bickford, Smith, and Co. the ordinary rushes were collected from the marshes, made up into small bundles, and taken into the mines as they were required for the use of blasting. The side of the rush was carefully opened with the point of a sharp instrument, which split the rush from end to end, and the pith was dexterously extracted, leaving the vacancy to be filled by fine powder. This process was generally performed while the miner's comrade was charging the hole and tamping it up. It should be borne in mind that in blasting with the rush fuse a stout copper wire was inserted in the charge, and drawn out after the hole was charged and tamped, thereby leaving a sufficient space for the insertion of the rush fuse into the charge. The copper wire was made smaller at the point, to admit of being easily drawn from the hole. The wire had a ring at the top, so as to admit of the insertion of a bar of iron, to facilitate its being drawn from the hole, which process was called "drawing the nail." It should be understood that the copper wire, or "nail," was withdrawn from the hole at several lifts, as the hole was being tamped up, by which means it could be more easily performed. Straws have been used in precisely the same manner for fuses, metal pipes, &c. The rush, straw, &c., have been superseded by another kind of fuse, so decidedly superior in its use, material, and safety, that its introduction is almost universal. It is composed of cotton threads, which are twisted around a core of powder, in such a masterly and complete manner as to present the appearance of a nicely wrought cord, having great durability and strength. This fuse is varied in durability and strength according to requirements, whether for dry, wet, hard, or soft ground. The best quality of this kind has an extra coating, made by an additional bandage of the same kind of threads, or by tape. The threads are compacted and solidified by a proper quantity of tar. Some of the fuses, manufactured by certain makers, have a complete coating of gutta percha outside the cotton bandage, so as to make them perfectly water-proof; and so completely is it put on that the fuses appear to be like neat gutta percha rods coiled up. Recently patents have been taken out for metallic fuses entirely; that is, fuses composed of a coating of metal only around the case of powder. The metal employed is lead in some instances and zinc in others. The zinc fuses are neatly wrapped in a square form, with a sufficient overlap to keep tight without being soldered. A combination of metal and cotton or tape has been patented, I have been given to understand. The certainty of action of all the ordinary cotton fuses in use is very great; to still increase this certainty, however, Messrs. Bickford, Smith, and Co. in their fuses have a thread, which has been steeped in some explosive matter, inserted longitudinally in the core of powder, thereby obtaining a twofold medium for the conveyance of the fire to the charge, and increasing the certainty of the explosion, by the chance of one medium acting should the other fail. The fuses manufactured by the companies generally are made in pieces of about 24 feet in length, which are neatly made up in coils, and placed in barels for safe transit to the destinations where they are used.

Having noticed the construction of ordinary fuses that have been and are in use, I come now to notice their action. The rush fuses, and all of like nature, on account of their extremely delicate texture, have holes preserved through the tamping to the charge, to admit of their insertion after the holes are charged and tamped. The reason is that the substance of the fuses are too flimsy and dangerous to admit of their being tamped against, as is the case with cotton fuses now in general use. The mode of lighting fuses of the rush kind is highly dangerous, and the number of accidents that have taken place in their use is enormous. A long snuff is made of paper, or other suitable material, and well greased with a miner's candle, and placed in a horizontal position under and across the fuse. The snuff is then lit at one end, so that the flame may reach the fuse at such given time as the miner desires; and the time he calculates for the travel of the flame of the snuff to ignite the fuse is intended to be ample to allow him to get out of the way of the blast. Should any slight obstruction, however, be in his way in his exit from the scene of the blast, so as to delay his escape, he is very liable to be caught, which may result in a serious accident, as, according to the nature of the fuses of such kinds, almost directly they are fired the hole explodes. It very frequently happens that the miner in fixing the snuff accidentally lights the "rush" before he intends, and receives the full force of the explosion. At other times the snuff may burn much quicker, on account of currents of air and other circumstances, than he calculated upon, and he is caught by the blast before he can possibly get out of the way, so that the immense loss of life and limb by blasting with rush and straw fuses has been appalling. The cotton and tape fuses now in general use are inserted in the charge before the hole is tamped. They resemble a piece of stout cord, of sufficient strength and substance to stand tamping against, with minimum danger. It is of the greatest convenience, and exceedingly safe. The mode of lighting them is by a snuff also, but it is of a different nature to that used in lighting rush and straw fuses, inasmuch as the flame of the snuff is placed immediately under the fuse at first, the fuse itself being of sufficient substance to prevent the fire reaching the core of the powder until a sufficient time has elapsed to allow the miners to get well away from the influence of the blast. In addition to this, the core of powder is so tightly bound up in the centre of the fuse, that it takes a considerable time to burn to the charge after it takes the fire, particularly if the fuse is dull, and the hole tamped rigidly tight. It not unfrequently occurs that, on account of the core of powder being damp, or rather dead, it takes so long a time to convey the fire to the charge that the miner thinks the hole has "missed," and returns to his work too soon, and the charge unexpectedly explodes, inflicting on him severe, if not fatal, injuries. The metallic fuses that have been lately introduced, not having come into general use yet, require no further description as regards their action, except stating that they are used in precisely the same manner as the cotton fuses.

The tamping of holes is the driving suitable stuff into the hole on the charge, in a more or less rigid manner; the object of which is to confine the charge as much as practicable, in order that the greatest possible rending strength of the charge may be exerted in splitting the rock. The material used is the least fiery that the place will afford. Plugging the holes, to confine the charge, is sometimes resorted to, under peculiar circumstances, with wood or other suitable material. This method, however, is a very indifferent one for confining the charge. The tamping of holes is performed by a bar of iron, having a perfectly flat end, and is struck on the head by a hammer. This bar is called the "ramming bar." What is meant by "barring" of holes is that after the holes have been charged and tamped up a strong bar of iron is placed on the tamping—that is, one end, and the other end against a step in the rock, so as to confine the tamping, that the blast may do better execution. The drying—or as it is termed in practice the "claying"—of holes is the means made use of to stop back the water that may be flowing into them, in order that they may be in a fit state to receive the charge. The process usually gone through to clay holes is to fill them with clay, and to drive a bar of iron, called a "claying bar," into the hole thus filled with clay, by which means portions of the clay are forced into the crevices that let out the water, and stop it back. In case the first claying does not succeed in sufficiently drying the hole to receive the charge the process is repeated, and in case success does not attend repeated trials a cartridge is prepared at once, sufficiently water-tight to preserve the charge. Much practical skill is required in claying or drying holes under some circumstances, according to the nature of the ground or rock, and the flowing force of the water into the holes. I may here remark that the shape of the claying bar alluded to is that of a frustrum of a cone, having a stout head, so as to stand the blows, with an eye in the end for the insertion of a bar of iron, to assist in withdrawing it from the hole. As the drying of holes frequently taxes the skill of experienced workmen, much less that of those comparatively inexperienced, a few remarks on the most effectual method of claying, or drying, holes, under the most difficult circumstances, may be very serviceable.

Wenford, Bodmin. GEORGE RICKARD.

MINING ON THE RHINE.

SIR,—The copper formation noticed there is nothing out of place; what they term *basalt* is more likely to be horneblende, or a hard elvan course, as either would cut off or shift *lodes*, or it may be termed a change of strata. These intersections bring the contents of rock and lodes near to the given point where they are held in check, and prevented from passing on, which causes the ore to settle down and grow; in fact, it was the meeting of many substances which caused ore to form where found. These are the first places in which a wide-awake miner would look for lodes, and trace them home to, or near, these changes of rock, as he should well know that 8-10ths of all the great deposits of ore found are in lodes near these changes of rocks. I am not an admirer of basaltic junctions; they at most times grow the wrong way, and not in places to suit my taste. N. ENNOR.

REFORM IN MINING, AND LEGITIMATE MINING.

SIR,—The letter of Mr. Charles Thomas on "Reform in Mining," in last week's Journal, I consider a very sensible one. I would, however, go a little further than he does. I think not only that there should be no "dead rent," that the dues of paying mines should be reduced, but that *no dues* should be exacted before a mine begins to pay. Surface damage to land is another thing. That must be paid; but perhaps there is room for reform here also. I mix, I may say, with a great variety of business men, and the common remark among them at present is, "It matters not what one tries: no good can be done, whatever harm." Well, being one of those who believe that legitimate mining is more profitable than any other branch of enterprise, I really wish such parties as those referred to would invest some of their means in it; and, were they to go about the matter in the way that business men usually go about everything, I am certain they would reap the most satisfactory results. Given the right property, and bringing to bear upon it the requisite capital, skill, economy, and energy, there will be great and lasting profits realised.

Whilst writing there is another matter to which I would briefly refer. It has often been a wonder to me that mining properties in foreign and distant countries should have been so much sought after by British capitalists, whilst so many valuable ones in our own country have been neglected. I suppose the explanation of this to be, "Distance lends enchantment to the view;" but I venture to assert that for one foreign mine which pays the British investor there are nine in his own country which would pay him. I have now had very considerable experience in mining, and the result is I would not invest a shilling in a foreign mine, although I had any amount of money. In conclusion, seeing that the capitalists of this country are more at their wit's end than ever as to investments, I believe they could not do better for themselves than to set about stimulating with their capital British mining industry. OBSERVER.

June 16.

THE NEW AND THE DEEP MINES OF CORNWALL.

SIR,—I observe it stated in last week's *West Briton* that 14 mines in one parish in Cornwall paid no less than 3,302,250*l.* in dividends, after the original outlay was repaid to the adventurers, but that only one out of all those mines *now exists*, and that that one will only just pay the cost of working at the present price of metals; yet we are told that nearly all this immense profit was realised when the price of tin and copper was lower than at present by 5 or 10 per cent. What is the cause of this vast change in things? I should like some of your readers to explain; doubtless they can assign some reason for this wonderful alteration. If mines at home cannot pay at present price, how can the great and expensive mines abroad meet the heavy cost? It appears they cannot, and the continued working them not only inflicts a heavy loss on the proprietors themselves, but prevents the more profitable young mines at home from being *explored*. Besides, a vast amount of the distress in Cornwall is to be attributed to the awful sacrifice of life in these unhealthy climates. The parishes of Redruth and Illogan contain more widows and fatherless children than the whole of the county of Cornwall besides. Not one man in 100 survives or lives out his usual engagement, I was recently informed when travelling in Cornwall.

I believe the deeper mines are wrought the poorer the ores would appear to get. Judging from the Ticketing Papers the last half century, which just fell into my hands, and curiosity led me to examine the weekly sales during that period, it is marvellous to observe the falling off in the percentage of the minerals, particularly that of copper. The landowners ought to reduce their royalty; this may in some measure be the secret. Very deep mines have no chance with new mines, and the owners of land seem asleep to their interest; in a few years they will not have the chance, as new countries are opened up, and vast mines of wealth will be discovered near the surface. Now is their time, whilst they have a chance. Property is of very little value when a country is deserted, and this must be the case with all countries when industry fails. ENQUIRER.

London, June 16.

BRITISH MINING AS AN INVESTMENT.

SIR,—The markets for every kind and description of property and securities remain dormant and inactive: occasionally, it is true, we observe a faint upward movement, as if the crushing feeling of distrust had for a time found some degree of relief in returning confidence, but the sequel is ever the same—inactivity, inanition, endless distrust. The public is disheartened, the backbone of enterprise is broken, the resources of the industrious and persevering are exhausted, whilst all the money, or active capital, of the country is centred in the few—*i.e.*, that class of the community who look to *bona fide* and negociable securities for their funds ere they *part;* and the time is not yet arrived when avarice prevails over intuitive and instinctive precautions. The prevailing depression of almost every kind of property has not, in the opinion of these gentlemen, yet attained its minimum level, and until the coffers of the Bank of England literally become choked, and money becomes absolutely of no use, from a superabundant harvest, and the contraction of trade and commerce, added to the all but total suspension of enterprise throughout the summer and autumn months, we shall probably have little or no improvement in the prices of speculative properties and undertakings. It is this indifference on the part of the monied classes to the wants and requirements of the enterprising and industrious members of the commonwealth that causes the existing stagnation in speculative prosperity and progress; and until this chronic feeling is dissolved no permanent improvement can be anticipated.

In the face, however, of this all but universal apathy, we can but look upon the Mining Interests of England as maintaining a fair, if not an over, average position, when compared with other branches of commerce and the home industries of our country. The prices of copper and tin are deplorably low, and, consequently, the dividends declared reduced, when compared with former years; but is it not also the case as regards gains in every other department of industry? We know of many who equally complain, as railway engineers and contractors, builders and architects for houses, drainage of land and cities, construction of docks, embankments, and tunnels, making of ships and chartering the same when fit for use, are alike unprofitable to both mechanic, artizan, and mercantile men. Who, therefore, at present has not cause to complain, and which class of Her Majesty's subjects, pray let us ask, feel it to a less degree than the mining interests of Great Britain? We have many mines now upon the tapis that present unusual prospects for the investing public, and probably at no former period during the past 30 years could young and progressive undertakings be purchased at so much advantage. We have, again, numerous dividend mines, that compare in market value with most other descriptions of property, both as to price and public recognition of their inherent worth. Let us, for example, refer to the Devon Great Consols, Minera, Great Laxey, South Caradon, West Chiverton, West Seton, Herodsfoot, Great Vor, Seton, and Dolcoath—ten of the leading dividend mines, yielding copper, lead, and tin, and recognised by the members of the Stock Exchange of London.

The Devon Great Consols was discovered in the year 1845, and since that period dividends of 1,128,448*l.* have been declared—say, about 48,000*l.* annually over a period of twenty-three years, or just 4800 per cent. annually, upon the entire outlay of 1024*l.* The present market value is 450*l.* per share, and the last two-monthly dividend 7*l.* per share—say, 42*l.* annually, or 9·33 per cent. It is, therefore, evident that this mining property is regarded by the investing public as equally eligible with the London and Westminster Bank, the Union Bank of London, the Turkish or Egyptian Government Bonds, and of many miscellaneous securities that formerly ranked high in public estimation, though now far more depressed, compared with market quotations of the years 1864, 1865, and early 1866, than the Devon Great Consols, and many another mine to which we could with equal justice refer. The Minera Mine sells at 170*l.* per share, and pays quarterly dividends of 5*l.* per share—say, 20*l.* per year, or close on 12 per cent. The Great Laxey commands a market value of 17*l* per share, and pays quarterly a 10s. dividend—say, 12 per cent. interest on market worth. South Caradon is a veteran of between 30 and 40 years growth, and has up to the present time ever been an improving and progressive property. The outlay was only 1*l.* 5s. per share, and the dividends are now 6*l.* two-monthly—36*l.* annually on a market value of 400*l.*, just 9 per cent. The total dividends have amounted to 300,032*l.*, which is 469 times the capital of the company. This property is apparently as prospectively valuable now as 10 years ago, far more so than 15 years ago, whilst the prospects are tenfold those exhibited 25 or 30 years since, when the works were comparatively in their infancy. The monied public show its appreciation of this investment by raising it on a par with joint-stock banks, building societies, insurance, dock, and canal companies, several foreign Government securities, telegraph, steam ship, discount, financial, and other well-selected home and colonial investments. West Chiverton, a lead mine in Cornwall, is the prize of the past seven years, and can be purchased to pay 12 per cent. interest—that is, at 64*l.* per share, paying quarterly dividends of 2*l.* Herodsfoot yields 1*l.* 10s. dividend quarterly, and commands a market value of 38*l.* per share, and has already paid back the entire outlay, with about 500 per cent. profits. West Seton is a copper mine of long standing, and, next to South Caradon, is unquestionably the best one for that mineral situate in West Cornwall. Dolcoath, which stands about a mile to the south, has been continuously at work for more than a century, has yielded over five times the product of the Devon Great Consols, and possesses reserves now estimated in the aggregate to exceed 1,000,000*l.* sterling, judging, from all appearances, the deeper the works extend the richer the veins become. The dividends amount to 4*l.* per share two-monthly, and should the price of tin advance the profits will more than proportionately increase. Great Wheal Vor is a tin mine, paying quarterly dividends of 7s. 6d. a share, upon a market value of 16*l.* 10s. to 17*l.* 10s., a fall of 2*l.* per share, yet still high enough. The costs are heavy, and the works will become more expensive as depth is attained. The aggregate dividends and commercial value fall short of the original outlay 40*l.* per share. The management at starting was extremely speculative and haphazard, resulting, as every practical miner foresaw, in a loss of 200,000*l.* to the adventurers. The success was a *fluke*, as unexpected as desirable. The discovery of a rich lode at Wheal Metal saved the property from destruction. The shareholders were exhausted and dispirited, and but for the energy of the local proprietary the operations would have been closed even after the discovery was made.

As regards producing progressive mines, there are many upon the tapis that could be made really valuable properties to their shareholders, but for long periods no profits have been established or dividends declared; the only parties benefited through continuing the works are the executives, workmen, and merchants, most of the latter being small local adventurers. We allude to such properties as North Crofty, South Crofty, Rosewall Hill and Ransom, North Roskear, Clifford Amalgamated, South Frances, Cook's Kitchen, Carn Brea, St. Ives Consols, West Caradon, West Basset, and Emily Henrietta. If mines in the position of these cannot be rendered profitable to proprietories there must be something radically wrong in the management or yield, and the sooner they are closed up, and the responsibility of out adventurers cease, the better will the issue prove to all non-resident shareholders. Mining enterprise in Cornwall, and throughout the mineral districts of England and Wales, will pay well if practically carried out; as, for example, mark the success of the late Capt. J. Lyle, in the cases of Carn Brea, West Basset, North Basset, Great South Tolgus, Kitty, Relistian, and Charlotte; Capt. P. Clymo, the banker of Liskeard and Par, in Trelawny, Mary Ann, and South Caradon; and, with his friend Mr. Hawke, at Herodsfoot and West Chiverton. Again, observe the unparalleled success of the Messrs. Williams, of Scorrier, and of the Messrs. Taylor, in the mines of Gwennap, Redruth, Illogan, and Camborne. To arrive at a proper estimate of practical mining at the present time we should refer to the results shown by the mines under the control of the Messrs. Taylor, of London—the Linares, in Spain, the Pontgibaud, in France, paying 110,000*l.* dividends yearly, the Lisburne, Goginan, Cwmystwith, East Darren, Minera, and many others, situate in various districts, and in almost every country where minerals can be wrought to advantage, attest their practical knowledge. R. TREDINNICK,

June 8. Consulting Engineer.

COST-BOOK SYSTEM v. CALLED-UP CAPITAL.

SIR,—The Cost-book System, as applied to the conduct and constitution of working our Cornish and Devon mines, is wrong in principle, and but very imperfectly understood by the general public: hence arises the discontent and misunderstandings, which too frequently end in quarrellings and ultimate grief to all connected therewith. The shareholders who are non-resident in those counties invest their money without making enquiries as to the actual position of the various undertakings submitted to their notice, and generally without making provision for the continued calls that at stated periods, upon making up the two-monthly or quarterly accounts, follow; thence they become involved in a series of liabilities, that first engender distrust, and then follows forced realisation, to escape from future possible contingencies. These are defects chiefly attributable to the management of cost-book mines, and are easily remedied, if the managers of companies would state in their periodical reports the probable calls necessary over a period of twelve months to come, the various points in course of operation, and the time required in their realisation. The true value of mining property is far better determined to the satisfaction of "out" shareholders by referring to pioneer objects, and their probable cost in time and money, than in merely referring to present "returns and expenditure," without reference to discoveries made and those likely to follow. It is quite possible for a mine to yield profits from the gradual absorption of reserves, whilst the ends and sinkings are comparatively poor. This was the case in Buller, Tresavean, East Rose, East Basset, and many other mines to which we can refer; and, as the sequel has unhappily proved, much discontent resulted to those who regarded immediate dividends as the criterion of value, instead of referring to and founding their estimate of inherent worth upon the ores actually being discovered, added to the importance and character of pioneer explorations in course of prosecution. We are aware that those who attend meetings of shareholders in Cornwall and Devon ascertain these facts for themselves, but it is no excuse to the respective executives of mines that absentees might be equally well informed had they attended likewise, and made themselves acquainted with the true position of the works, as others had done.

We should remember that Cornish and Devon mines are not what they used to be, and that experience of late years has proved that they cannot be wrought without "foreign" support. The local adventurers in mines rely for sustenance and help from capitalists resident throughout the length and breadth of the land, and it is only right that those who find the sinnews of war should be made acquainted with the details of the various properties in which they are so pertinently interested. Why not form companies to work mineral properties upon the same principles as the construction of docks, railways, ships, drainages, and various mercantile, manufacturing, and trading undertakings? These are equally hazardous and uncertain in their results, and equally speculative and open to question as to the capital required, or the time and casualties involved in the expenditure thereof, with the development of mineral veins, and the detection, with the aid of modern sciences and the arts practically applied, of productive and profitable deposits of ores in the Cornish

and Devon lodes. We, therefore, advise the formation of companies in future with paid-up capitals, and with ample provisions in the Articles of Association for raising more or additional monies for the extension and completion of works whenever funds become exhausted, precisely upon the same principles as applied to every other speculative enterprise of the day. Why should mines be worked on the Cost-book System? It is absolute and positive co-partnership! Each and all of the shareholders are responsible for the whole debts contracted, and, therefore, absentees fear responsibilities, and hesitate to embark their capital in mines. Unlimited liability is even more objectionable than direct taxation; the first is as fatal to the expansion of confidence in the working of Cornish and Devon mines as the latter is embarrassing to a Chancellor of the Exchequer with a deficient revenue to meet an inflated expenditure, having an exacting minority cheered into hopes of retrenchments through vascilating adherents to contend with.

The Cornish motto—"One and All," fifteen balls—is good and very appropriate to mining when well applied, and is exceedingly cheer- upon the principle of fair play, which it would appear to embody exemplify; but we are all more or less acquainted with the "sign" over the doors of pawnbrokers—three balls, signifying that what you have in pledge with your "uncle" there are *two* chances to *one* that you will never get back again. Now, I do not mean to state that Cornish and Devon mining, fairly and honourably carried out, and conducted like other enterprising and speculative investments, is anything but remunerative and advantageous to those practically conversant with such pursuits, but I do contend that the public in their dealings in mines recognised by the members of the London "Mining Exchange" are much worse off than the *pledgers* with the pawnbroker, for they have not only *two* but *fourteen* balls to *one* against them in embarking into mining companies, because they are advocated by London brokers and promoters of cost-book schemes, that prove not only ephemeral in their existence, but also expensive and objectless in their workings. The want of practical experience and management in the conduct and development of lodes or veins is lamentable to witness, and not unfrequently the grants or setts are destitute of every element essential to success, and which scientific authorities could easily have detected at starting, and thus have saved all the money embarked. The capitalists must be informed, however, that this description of concocting companies for the benefit of promoters and share exchange gambling operations is not *mining* at all; it is simply a species of vehicle used for drawing money out of the pockets of the unwary, to enrich the initiated, at the expense of those who become fascinated with dealings for fortnightly settlements, that ever end in absorbing the whole principal involved betwixt the "outsiders" and the members of the "Exchange."

Those who join mining authorities in working the ascertained productive lodes of Cornwall and Devon, in the West of England, for yield of copper and tin, and those of Cardiganshire, Montgomeryshire, Flintshire, Cumberland, Durham, Yorkshire, Shropshire, Isle of Man, and other districts for yield of lead and silver ores, cannot but do well, for there is no other pursuit that pays so largely, or offers so many inducements for the investment of capital, as legitimate mining, nor is there any other description of property that affords so many interesting and exciting examples of substantial success, and frequently upon comparatively small outlays of capital. We would, therefore, advise all living at a distance from the mines in which they have embarked to consult practical authorities as to the inherent worth of that which they possess, for there is frequently as great a difference in intrinsic value betwixt a market "favourite" and a *bona fide* paying substantial "mine" as there can possibly be betwixt a repudiating American State, or a defaulting Spanish Ministry, and the honest, ever-paying English Government. R. TREDINNICK,
London, June 15. Consulting Engineer.

THE ROYAL COMMISSION ON TRADES UNIONS.

SIR,—If any evidence were required of the necessity, in the interest of the working classes themselves, for rendering the existences of Trades Unions illegal, I think it would be afforded by the evidence of the miners' agents taken before the Royal Commission on Trades Unions. Mr. Pickard, the agent of the Wigan miners, has admitted that in return for the promise of 9s. per week to the miner who refuses, at the dictation of the Union, to earn a honest livelihood, he is enabled to extract something like 1*l.* 17s. 6d. per year from each miner, and to live comfortably by "stumping," instead of working like others of his own class. It is, no doubt, quite true, and it reflects great credit on Mr. Pickard, that he did use some efforts to prevent the actual commencement of the recent strike at Wigan; but, unfortunately, these efforts did not commence until he had raised the men to a state of comparative frenzy, and placed them even beyond his own control. Mr. Pickard had made too many erroneous statements as to the injustice the men had received at the hands of the masters to be able to withdraw them suddenly enough to prevent unpleasantness, more especially as the men knew that funds had been raised by themselves for the express object (see No. 15,840) of supporting the men when, with the sanction of the majority, they opposed the masters.

But although upon one occasion Mr. Pickard so far forgot himself as to make most injudicious remarks at a meeting, it is gratifying to find that the Miners' Association have not yet, as an association, been guilty of any outrage against either person or property. Now, if Mr. Pickard really possesses so great an influence over the men, could he not use it to their advantage instead of for the purpose of bringing them into opposition to the masters? He should tell the men that it is only their fearful habit of excessive drinking that makes them poor and discontented, and unable to meet a period of depression in trade, however much money they have earned in the time preceding. It is Wm. Pickard's sobriety that has given him his power, and if he were to induce his fellow-workmen to become total abstainers, like himself, they would never be in the plight they are now. Look how many of the South Yorkshire working colliers have their own cottages, and rents enough coming in to tide them over when trade is bad, but these are not men who spend half of their earnings in drink.

Instead of pointing out such things as this, Mr. Pickard attributes the bad state of things existing in the mines to the importation of Cornishmen into the Wigan district, and makes such remarks to the committee as (No. 15,863)—"I think it is quite contrary to common sense and reason to take strange men, ignorant of the nature of gases." Now, such an observation is altogether unjustifiable, for not only are Cornishmen quite as well acquainted with the nature of the gases as the Wigan men, but I suspect that if the Inspectors' returns be looked at it will be found that the accidents to the "strange men" have been fewer than to the old hands. Mr. Pickard should not condemn a whole class because they happen to have been born in another county. This wholesale condemnation, however, he compensates for, to some extent, by his kind references to Mr. Peter Higson and the late Dr. E. H. Birkenhead, who was universally respected. The only other piece of Mr. Pickard's evidence concerning which I would venture a suggestion is that concerning the Wigan riots. He has the cool effrontery to say the quelling of those disturbances should have been left to Mr. McDonald and himself, remarking that the local magistrates were justified in having the police and soldiers in reserve, but the exposing and exhibiting of them was premature, and led to strong irritation. But, perhaps, more may be learned about Unionism hereafter. Lord Elcho summed up the chief points of the system which Trades Unionism advocates, and will, no doubt, lead to if permitted to continue; and even Mr. Pickard frankly admitted that he would not like to see the country established on that system—an opinion in which all thinking men will coincide.—*Wigan, June 8.* AN IMPORTED CORNISHMAN.

THE SLATE TRADE IN THE UNITED STATES.—The slate belt proper of Pennsylvania begins some miles behind the village of Slatington, in Lehigh county, and seems to be confined to one direction. In a belt from ½ to ¾ of a mile in width, it passes along over the bed of the Lehigh River, where at low water the slate becomes plainly visible. Slatington is situated as it were in the very centre of this belt, and is, therefore, the centre of all slate operations. It is stated—on what authority we do not know—that slate found in the northern part of Alabama is mined on a continuation of this very belt. It is astonishing that capitalists have not devoted more attention to these real gold mines—the slate quarries. There is as yet no competition in this line, nor will there be for years to come, and the product of slate is as good as so much bullion.—At present the demand is 75 per cent. greater than the actual production, and is augmenting daily. The money made by some of the Slatington quarry owners is something incredible, a few examples of which, for illustration, will suffice. . Henry Williams, owning a quarry just behind the village, during last summer netted over $200 per day; Mr. David Williams' quarry, situated a few miles n the Lehigh Valley Railroad, has netted its owner from $100 to $150 per day, d he has repeatedly refused $250,000 for the same, although comprising only eight acres. A few hundred feet from this is the famous Keystone Quarry, which has also netted to its owners large sums of money. The Franklin Quarry, purchased a few years since from the Lehigh Slate Company for $89,000, could not now be bought for $300,000. Just opposite Slatington, on the other side of the Lehigh River, we have the Twin City Quarry, which is in profitable working. The amount of slate that can be produced from one quarry varies according to the space they have to work in. Four hands are generally employed in finishing the slate—two men for mining and blasting out the blocks, and two men for splitting and dressing it into tablets. The wages of these hands are about $10 per day, and they can finish from 8 to 10 squares per day. [A square is generally considered 10 ft. each way, thus making its contents 100 square feet.] At present the slate commands a price of from $7·50 to $8 per square, and deducting expenses of carting to depôt, rubbish hands (who remove the debris of the slate) and incidental expenses, it still leaves an enormous profit. Even should the price of slate fall to $4 or $5 per square, there would still be a profit of 75 to 100 per cent.. This from only one quarry and four hands, the profit can be estimated to be at least $25 per day nett. The progress of the slate business has been something stupendous. The beautiful village of Slatington has been built up in five years, and the demand for houses is enormous. Over 100 houses are to be built the coming summer, and building lots (50 × 150) bring (in a good location) from $800 to $1200. The Pennsylvania slate is peculiarly valuable. It has a deep colour, tough texture, and contains no iron pyrites, and is consequently very durable.—V. G. BLŒDE: *United States Railway and Mining Register.*

THE SOLAR SYSTEM GEOLOGICALLY CONSIDERED—No. III.

BY THE AUTHOR OF "ELECTRICAL CONDITION."

By the authorities at our disposal it is said that the Devonian formation, overlying the Silurian, occupies a surface in Russia as large as the whole of Great Britain; that it prevails in England, and in the valley of the Rhone, and in the Western States of America, and that in Spain the coal-bearing strata are associated with it, whilst in France the coal beds are on the granite. And as Russia, England, &c., were on the north of the belt, and the Western States of America were on the south, and Spain was to the west of France, so far as we can see, the first formation did not extend beyond a few hundred miles towards the equator. And, as the outer edge or top of the bright ring round Saturn is only 250 miles wide, whilst, in all probability, the bottom of the dull ring is more than a thousand, the pressure or resistance of that ring must necessarily increase towards the centre.

We are told that coal is the product of ancient vegetation, entombed in mud and sand, and, in the course of ages, reduced to its present state, by chemical change, *in the absence of air.* We are further told that that vegetation was of a soft nature—that it attained gigantic proportions; that it sometimes crosses the sandstone at right angles, that the roots are always in shale, and that it abounds in nearly all parts of the world. When the temperature of the earth had become sufficiently reduced to admit of vegetation the plants took root on the banks of the trough (shale), and when the accumulation was sufficient to overcome the resistance of the ring it glided into the trough, where it was subjected to compression, and was followed by sand or other matter; an operation that was repeated an indefinite number of times. Sometimes, however, the sand, &c., instead of accumulating behind, overran the lower parts of the plants while growing, and the trees, thus protected, retained their upright position; and this description, short as it is, completes our history of the first of the coal formation, so far as regards the plants.

Associated with coal is iron, and we are told by our authorities that magnetic iron is a compound of two atoms of peroxide and one atom of protoxide. That it forms extensive *beds* in Norway and Sweden, and that at Danemora the *beds* are excavated *to the day;* and that the amorphous masses of Siberia and the Hartz, which yield the most powerful natural magnets, may be associated with this species; and it certainly requires no great stretch of the imagination to comprehend that the gas of iron, if exposed to the action of vapour, should oxydise; and it is equally conclusive that this *deposition* took place on *primitive soil, now in proximity to the magnetic north;* and in the absence of sulphur and of carbonic acid.

All the iron ore of England is associated with the coal bed formations, which was long after the formation of the primitive soil, and it is either a carbonate or sulphuret; and it may be reasonably assumed, as changes are taking place in the rings of Saturn, that the metal came from the outer bright ring, and in its descent combined with either carbonic acid or sulphur, which latter material, in all probability, forms part of the dull ring of 17,000 miles. And the intimate manner in which the materials are combined speaks forcibly of gaseous and not of solid matter; the compound being very different from the sulphuret produced by rubbing a stick of sulphur against a bar of iron at the white heat.

"According to Cotta, the total thickness of stratified deposits may be assumed at 22,750 ft.," and we have disposed of about 19,000 ft.; and as the pressure of the ring has considerably decreased, sufficient, it may be presumed, to admit of the presence of water, the plants of the coal formation, more to the south and north, or nearer to the equator, as those of India and Africa, may have taken root on elevated ground under the ring, or have been floating islands, not uncommon in the present day; and where sunk by the accumulation of matter, were covered by the earthy matter brought in by centrifugal; and if so, their roots should not be in shale.

If our interpretation of this important operation in creation be correct, the earth at this period could have been nothing more than a girdle round the Earth, its sides being composed of comparatively solid matter—the first deposition—with slushy matter within; which sides and interior would gradually rise to the level of the rest of the globe as the pressure of the ring decreased; and in Mr. Pouillet's work of 1853 it is said of Jupiter's belts, *or belt*—

"On remarque que les bandes sont moins sombres aux deux extremités, dans le voisinage du limbe; cette circonstance est importante, elle semble indiquer, d'après M. Herschel, que la planète a une atmosphère d'une epaisseur considerable, reflechissant plus de lumière que la surface solide elle-meme, et que là ou les bandes paraissent plus sombres, c'est le corps de la planète, comparativement noir, qui devient en partie visible."

From which it is evident that we see only Jupiter's "atmosphere;" and as there centrifugal is so enormous, it must be equally conclusive that he can have but one belt, the density of the centre, the apparent space, probably the residue of the bright ring round Saturn, being much greater than that of the outsides, "where the body of the planet, comparatively black, becomes visible."

In this orbit, which is highly electrical, and where centrifugal is nominal, matter is dominated by gravitation, repulsion from above (see the papers of 1849); but in the orbits of Jupiter and Saturn gravitation must be nominal, whilst centrifugal is enormous, and, as a necessary consequence, vapour and gases, instead of being in layers, must be in zones, occupying positions next to the equator agreeably to their densities; so that the vapour formed at the equator would take up positions outside the zones of carbonic acid, or at or towards the poles, where water would be constantly on the increase, and when acted on by centrifugal bring matter to the equator; and it is this operation which we designate as the period of slush, from the Permian, which immediately overlies the carboniferous, to the base of the cretaceous, which follows the wealden, when the *ocean* had sufficiently accumulated to overrun a great portion of Europe; and all these formations, the geologist must allow, are of the same character, differing only in their fossil remains, which fossil remains increase or decrease, constitute nearly whole strata, and then disappear; as influenced by zonic changes.

The carbonic acid and subsequent hydrochloric acid orbits were necessarily inimical to animal life, and we are told the previous order of beings decreased in the coal beds, and became extinct in the Permian, whilst a higher order entered on the stage,—first half fish and half reptile, then reptiles. Carbonic acid is composed of 73 oxygen to 27 of carbon, and for every 27 tons of carbon deposited in the coal beds there must have been 73 tons or oxygen liberated; a mass of matter, although ignored, that must have been disposed of in some way; and which gas would naturally take a position as zones outside those of carbonic acid. Under these zones of oxygen, we conceive, the reptile class of creation came into existence, and their remains were carried to the coal bed formation by centrifugal, with the sand and other matter covering the vegetation; and as these animals would migrate as the zones shifted position, their term of life must have been throughout the whole of the period that the planet took in passing through the carbonic and hydrochloric acid orbits. These acids are preventives to decay and putrefaction; but when the oxygen zones got access to the coal beds they converted all those portions within their influence into anthracite or stone coal, which is on the top of the beds; but, through fissures or vents, this gas may have got access to lower portions.

The ocean and atmospheric periods, we conceive, were in the orbit of Jupiter, and who has an inclination of 2°, evidently not without a purpose; and that purpose we shall assume to be the sending to the north all the gases of which the atmosphere and the ocean were formed, so that as the ocean increased, from accumulation of vapour *and other causes*, it overflowed the belt; and the passage of the waters must always have been from the north to the south side of the belt, carrying with it such matter as lime, clay, and sand; then gravel, then boulders, and finally erratics in the orbit of Mars, when the earth crystalised, and large masses of ice must have flowed over the land.

It has been surmised that the *ocean* acquired its salt by degrees; and as the gas of iron came down at different periods, it may be presumed the sodium did so also; and whether it first formed an oxide and then a carbonate, its affinity for hydrochloric acid would ensure its ultimate combination with that gas, but all which combinations must have been on the land or belt, so that as the waters of the land were salt and the ocean was fresh, however mortifying may be the conclusion, the "marine" formations were of the land, and the "fresh water" of the sea; although the geologist, guided by present conditions, has supposed that the water of the land was always fresh, which evidently could not be, even if the salt were carried into the sea by rivers, his way of accounting for the ocean having become salt by degrees. And this marine condition of the land has also induced the supposition of a universal deluge, whilst, although the headlands of Cornwall and Devon were washed bare to the very bone during the boulder period, it can be shown that the Côtes-du-Nord, of France, the same formation, have not been under water since the granite was raised; the huge masses, similar to the Logan stone, being there *still* embedded in several feet of loose sand; non-crystallised granite.

DUDLEY AND MIDLAND GEOLOGICAL SOCIETY.

This popular and useful society held its annual meeting in the Society's Museum, Wolverhampton-street, Dudley, on Tuesday, and was attended by a numerous body of scientific gentlemen. Amongst them we noticed Messrs. S. Bowkley (in the chair), E. Hollier, Henry Johnson, H. Beckett, W. Jenks, Samuel Bailey, William Spruce, A. Freer, Josh. Cole, Thomas Bolton, J. Lee, Henry Burton, George Spruce, T. Parton, D. W. Lees, Charles Ketley, William Madeley (secretary), J. S. Lister, E. J. Renaud, A. Morgan, E. B. Martin, and others.

From the report read it would appear that the society is in a very flourishing condition, both as regards acquisitions of new fossils, first-class books for the library, and funds.

During the last 12 months the unique collections of Silurian fossils belonging to the late Mr. Mushin and Mr. Charles Ketley have been purchased, and added to the Museum, at a cost of upwards of 200*l.* It is said the Museum now contains the finest collection of Upper Silurian fossils in the kingdom.

After electing the officers for the ensuing year, the Earl of Dudley being President, the members discussed the new discoveries made in fossils, &c., which lay upon the table for inspection and examination. Mr. Henry Johnson exhibited a very beautiful specimen, showing the stalactitic effect of mineral water upon a species of rush plant, measuring 4 feet long and nearly 2 feet in width, taken out of Messrs. Grazebrooke and Aston's pumping pit, 150 yards from the surface. It is impossible to describe the beautiful and graceful appearance of this specimen. It appears to consist of a mass of fine rush-like stems, coated to the thickness of ¼ inch with oxide of iron and carbonate of lime. The plant, however, forming the nucleus, bifurcates, and, towards the lower end of the specimen, forms innumerable branches, all coated as before stated, and lying in the most graceful forms. The difficulty seemed to be to account for so large a growth of plant life at so great a depth from the surface. Mr. Johnson also exhibited some very interesting specimens of burnt shale, clearly explaining the formation of the hexagonal columns in the columnar structure of basalt, such as the Giant's Causeway in Ireland, and other places. Mr. Hughes exhibited his lithographed section of the explorations for coal over the Western Boundary Fault at the Earl of Dudley's No. 23 Himley Pits, which elicited much praise for the clearness of outline.

After discussing, also, the luncheon provided for the members, they set out for a visit to the Earl of Dudley's No. 49 Pit, Pensnett Colliery. At his lordship's Wellington Road Coal Wharf, in Dudley, Mr. Frederick Smith, his lordship's principal mine agent, had got in readiness a locomotive and trucks, and under the able driving of Mr. William Jefferies, his lordship's agent of the colliery department, the whole party were conveyed to the pit referred to. Arrived here, the whole party, under the guidance of Mr. William Spruce, his lordship's mine bailiff of the Pensnett and Himley districts, descended and made an examination of the effect of the trap rock upon the thick coal. The thick coal here is about 150 yards deep, and is very much interfered with by the intrusion of trap rock, which is supposed to have been injected from the neighbouring basaltic hill, called Barrow Hill. About 100 acres of the thick coal hereabouts is much affected by this rock, so much so in some cases as to render the coal quite useless, every bit of nature having been distilled out of it by the great heat to which it has been subjected. The coal in some places is shot through in every conceivable form; in some places in large masses, in others like forked lightning, but wherever the coal is in contact with the trap it is reduced to coke or anthracite. Thousands of tons per week are, however, being sent away for locomotive purposes; being smokeless, hot, and durable, it is highly adapted for that purpose. The party having reached the pit bank in safety, and again taken their seats on the train, Mr. Jefferies drove them to the new plant in Himley Wood, which is almost within sight of the once secluded and beautiful seat of the Dudley family, Himley Hall. Here the party inspected the arrangements made for raising coal on a very extensive scale. Pits sunk and extensive drivings and preparations underground, awaiting the improvement of the coal trade to do a very extensive business. Some idea of his lordship's capabilities in the coal trade may be inferred when it is known that over the five miles which the party travelled his pits and engines bristled in every direction on both sides the route. It was said that on this the east side of Dudley alone his lordship could raise 35,000 tons of coal per week, and his private railway and branches here measure 45 miles.

On the return of the party to the Wellington Road Wharf a vote of thanks to his lordship's agents was most cordially given, the party adjourning to the Dudley Arms Hotel for dinner at 6 o'clock, after which a very pleasant and instructive evening was spent, to the delight and enjoyment of all present.

ON THE DISCOVERY OF COAL NEAR TROWBRIDGE.

We announced some few months since that coal had been discovered in a field on Paxcroft Farm, situate between Hilperton and Semington, and about two miles from this town; or, rather, that indications had presented themselves in the soil which led to the belief that what is geologically known as the "coal measures" were to be found in our neighbourhood. We also stated that this fact was known to the former tenants of the same farm for years past; but, in order to avoid any interference with their agricultural operations, nothing publicly was said about the matter till the present tenant, Mr. John Little, occupied the farm. This gentleman, be it remembered, has jumped at no hasty conclusion, but has based his opinions upon observations made on the nature of the soil in this locality for the past 20 years, and a comparison of it with other similar soils in the coal districts of Somersetshire and Gloucestershire, where he had previously resided. He took the precaution to submit his opinion to Mr. Handel Cossham, a practical mining engineer and coal proprietor of considerable experience in the neighbourhood of Bristol, to whom he also showed specimens of the soil on Paxcroft Farm, and Mr. Cossham's reply is:—

"I have examined the specimens of clay, shale, and coal you have showed me, and also noted the place on the geological maps where the said specimens are said to have been found; and my opinion is that the specimens you showed me are taken from 'coal measures.' I see that it is not improbable that the Somersetshire coal fields extend as far east as the point you have showed me on the map. Let me advise you to sink a small pit a few yards west of the point where you have found the said specimens, then I will come and examine the place and report you my opinion. HANDEL COSSHAM."

Desirous of placing the matter beyond all doubt, Mr. Little also consulted Mr. John Anstie, a gentleman employed in a Government survey of the coal districts. He confirms Mr. Cossham's opinion, as the following letter will show:—

"Having recently been engaged in a survey of the Somersetshire and Gloucestershire coal fields for the Royal Coal Commission, I have visited the spot where coal indications are said to have been found on the Paxcroft Farm. The portion of clay, &c., shown to me give certainly the impression that a coal seam may extend below; and the position of Hilperton on the map is nearly in drift with the seams of the Nettlebridge Valley. There is also a 'fault' extending through the district, which passes near the spot where the appearances of coal have been found, which may possibly have brought up the coal measures to the surface. Under these circumstances, it appears to me that an experimental shaft, or boring, should be put down to a depth greater or less, according to appearances, as the work proceeds. JOHN ANSTIE."

With these and many other similar opinions to confirm him, Mr. Little at once applied to his landlord, Earl Manvers, and laid the matter before him, and his lordship directed an experimental shaft to be sunk, and the result, as the work proceeded, disclosed abundant specimens of the carboniferous shale, a stratum that always exists close to the coal measures. The work went on as far as practicable till it came to the boring process, which precedes the more serious details of mining, and the further the shaft was sunk the stronger became the indications that coal existed near, as the specimens of clay, shale, fossils, &c., taken from the shaft show. Earl Manvers meanwhile consulted Sir Roderick Murchison, whose opinion differed somewhat from that of the gentlemen above named, which induced his lordship to leave the matter for the present, and consequently the work was stopped. In the face of such an authority as Sir Roderick, who is a giant in geology, what can be said? We know that this scientific veteran succeeded in establishing what is called the "Silurian System," which comprehends a succession of strata that lie beneath the Old Red Sandstone (all below the coal strata) which seem to be in close approximation to the deposits that preceded the existence of plants and animals; and also that Sir Roderick was the first who publicly declared the opinion that gold must exist in Australia. At the same time, it must be borne in mind that geologists, like doctors, sometimes differ. Mr. David Page, F.G.S., writes:—

"With regard to the formation of coal, geologists are by no means fully agreed, nor do the facts of the science yet warrant a dogmatic decision. Some 20 or 30 years ago (the very period when Sir Roderick published his theory) the subject was a favourite one with writers on geology, the most positive views being generally put forward by those who had the least practical acquaintance with the subject. On examining sandstone or shale, it is easy to perceive from their texture and composition that they must at one time have been respectively loose sand and mud, borne down by and deposited from water, but the case is somewhat different with beds of coal. This mineral being chiefly composed of carbon, hydrogen, and oxygen, the same elements (though differing in proportion) which enter into the composition, and revealing in its mass evidences of vegetable structure, no doubt is entertained of its organic origin. But whether the plants of which it is composed were drifted down by rivers, and deposited along with layers of sand, mud, and in estuaries, or whether dense forests and peat mosses were submerged, and then overlaid by deposits of sand and mud, are the two main questions at issue. According to the latter hypothesis, the vegetable matter must have grown and accumulated in dense jungles, and peat mosses for many ages (millions, not thousands of years, says Prof. Pepper); then the land must have sunk and become the basin of a lake or estuary, into which rivers carried mud and sand; these, covering the vegetable matter, gradually consolidated into shales and sandstones, while the vegetable matter itself underwent the process of bitumenisation and mineralisation, and was converted into coal. This being done, it is supposed that the area of deposit was again elevated so as to become once more the scene of luxuriant vegetation, again submerged and overlaid by new deposits of sandstone and shale, once more elevated and covered with plants, and then submerged; and this alternating process of submergence and elevation is presumed to have taken place as often as there are beds of coal in any particular coal fields."

So much for the question of the formation theory. It will be seen, therefore,

that eminent authorities may be open to correction on the subject of the formation of coal, and that those persons practically acquainted with the subject are the most reliable judges. The opinions of the practical men given above are very favourable to the supposition that coal exists in our neighbourhood; and, further, they are borne out by what actually took place not three miles from the spot many years ago. Prior to the discovery of the Melksham chalybeate spring, an opinion was entertained by gentlemen at Melksham that coal existed in that neighbourhood. An eminent mining engineer was consulted, and he confirmed the opinion that a coal seam was to be found on the southern part of the town. A company was formed, and the process of boring carried out till the coal was actually struck. The chalybeate waters at the same time broke in upon the fortunate discoverers, but that was not the greatest obstacle they had to contend with. The news of the discovery of coal reached the Somersetshire coal district, and what followed was not exactly known, for there were no inquisitive newspapers in those days to ask why it was that a scheme fraught with apparent good to the neighbourhood at large, and brought to so favourable a point, should be allowed to be snugly hushed up. However, such was the fact. The Melksham Coal Company suddenly ceased to prosecute their investigations, and quietly dissolved, and the abandoned shaft, with a pailing round it to prevent accidents to cattle, stands to this day, an indication that Mr. Little is not the only man who has dared to start a theory which, if boldly carried out, might prove antagonistic to the interests of wealthy coal proprietors in other districts.

But there is this difference between the Melksham and Paxcroft discoveries—the latter has not yet been hushed up; it is simply in a state of suspension. Then, again, some years since a body of men in another direction were so convinced that coal existed in the neighbourhood of Road that a shaft was sunk on Road Common and coal struck; but again the influential coal lords intervened, the scheme imperceptibly collapsed, the shaft was arched over, and there it remains to this day, tangible evidence at once of the sincerity of purpose of Road reformers and the overbearing influence of monied men. The same might be said of the effort that was long since made at Crockerton, near Warminster, where a shaft was sunk and coal struck, but the money monopoly again prevailed, and this shared the fate of the Road and Melksham schemes, and Crockerton pond now marks the spot where the shaft was sunk. However, all these instances show that coal does exist around and near us, and the greatest difficulty to be overcome in obtaining it is the monied interest that will be sure to be brought to bear against anyone who dares to invade the realms of the rich coal proprietors of the West. But of that we have no fear now-a-days. The difference of opinion now only lies between theory and practice—theory says the coal seams are not in this locality; practice says they are. Men who have elsewhere penetrated the bowels of the earth and found the precious mineral have handled and examined the specimens of strata found at Paxcroft, and they say we are right upon the coal measures. By continual observation, geologists have found that all, or nearly all, the coal formations are concave or basin shaped—*e.g.*, the northern coal fields, where underland forms the centre or deepest portion of the fields, Northumberland the northern, and Durham and York the southern runs or edges of the basin. This is evidenced nearer home—at Malmesbury, Wilts, where the seam assumes a basin shape. With every probability in our favour, then, the Trowbridge people ought not to let this matter fall through without a trial, especially as it only requires a few hundred pounds to carry out the preliminary borings in order to ascertain the correctness of the opinions advanced.

Closely adjoining the spot from which the specimens have been dug lies the estate of our neighbour, Mr. Richard P. Long, M.P., who has always manifested a warm interest in matters pertaining to the welfare of Trowbridge, and whose forefathers themselves, convinced that coal existed on the estate, sunk a shaft no further off than Steeple Ashton, where the spot known as "Coal Corner" now bears testimony to the effort, but the project was not carried out. It may be possible that Mr. R. Long, now the Earl has given it up, might feel disposed to make enquiries relative to the discovery, and should he do so, and be satisfied of the correctness of the opinions held by the gentlemen who have considered the subject, we believe the scheme will have a fair test.

— *Trowbridge and North Wilts Advertiser.*

MINING IN NEVADA, U.S.

[From our Correspondent.]

After describing the Highbridge Mine of the Combination Company, it will not be out of place to notice more particularly the developments already made and in progress on the "El Dorado South." The great vein of the El Dorado is covered by locations, reaching to the extent of 6400 feet. Its course is nearly north and south, and it dips to the eastward. It lies between walls of the hardest slate. The two principal claims on the vein are those of the Belmont Company (El Dorado North), and W. F. Leon and Co.'s (El Dorado South), the ground of the former company lying north of the boundary line, and the latter south of it. North of the boundary the ledge outcrops boldly, and continues to break the surface for nearly 700 ft. to the southward, running through the ground of W. F. Leon and Co. Some very fine ore was obtained from parts of this outcropping mass. Quite recently a very important discovery was made on the ground of W. F. Leon and Co., near to the outcropping mineral. In making an excavation along the ledge a yellow deposit, nearly the colour of sulphur, was upturned. It occurs irregularly, being sometimes in layers and sometimes in bunches, and again it is found mixed with pulverised black slate. Under the belief that the yellow stuff contained chloride of silver the owners had samples of it assayed, the result of which confirmed their belief; and they also had about 2 tons of it worked at the Manhattan Mill, at Austin, which yielded at the rate of $557 per ton. The width of the vein in the claim of W. F. Leon and Co. has not yet been clearly defined, though appearances would indicate it to be from 27 to 30 ft. as far as developed, which is by incline to the depth of 131 ft. From the surface downward the incline is cut through quartz, the upper half of which shows signs of disturbance, and is somewhat broken; but below, and particularly towards the bottom, the vein becomes compact, and exhibits masses of fine looking ore. At several points along its course the roof of the incline, which is about 6 ft. high, appears to be a hanging wall of the ledge, for there are large surfaces of slich, black, reasy looking talcose slate, resembling the handsome selvage of the vein. But a slight penetration into the ceiling, in several cases of less than an inch, shows the appearance to be deceptive, and that above this illusive head wall there are deposits of light chloride ore, only a shade darker and quite as rich as that found upon the surface. The width of the ledge at the bottom of the incline is a matter of conjecture, though fully as wide as above stated. Large masses of ore which have just been taken out is more or less covered with horn silver. The ore resembles in its general appearance that produced by the Highbridge and Transylvania, but its display is less brilliant; it lacks the variety of tints of blue or green imparted by the carbonates of copper, but exhibits more of the sombre yellow and brown shades acquired from lead and iron. Although the vein matter is occasionally broken in the upper half of the incline, there is scarcely any change in the dip of the vein, and certainly nothing resembling a fracture or dislocation. It is perfect in its regularity.

A level extends a short distance north and south from the bottom of the incline, and in its course the vein exhibits a large proportion of superior ore, much of which is decomposed, and may be reduced readily. The apparent great size of the vein, the high quality of its ore, and the unbroken uniformity of its dip, promise splendid development below the water level. There is piled up at the mouth of the incline upwards of 100 tons of choice ore, which will yield at least $200 per ton, there having been over 40 tons of this class of ore already transported to Austin, and worked at the mills there, resulting in a yield of over $200 per ton. The large lot now on the ground of the company was taken out for transportation, and is fully equal to any lot of ore which preceded it. The extent and character of the work which has been done upon the mine has been entirely unaided by capital. The ore produced by the mine has paid the entire expenses thus far incurred, and the rich chlorides recently uncovered in large quantities will speedily create a substantial fund for working purposes. The success of the El Dorado South should encourage the owners of other claims in the district to give them fuller development. A year ago the El Dorado was hardly thought of in connection with the prospective great mines of the district, but now it is readily conceded a foremost place amongst them. It is not only a good mine, but it has been well managed by Messrs. Leon and Mullen. The latter gentleman, who is an experienced and intelligent miner, has conducted operations at the mine from the surface downwards, not only as a superintendent, but as an active hand at the work for months, and their reward for perseverance and industry is the possession of one of the very best partially developed mines in Eastern Nevada. An assay lately made by Cahill Brothers of a sample of chloride ore taken from near the surface of this mine gave the enormous yield of $19,365 of silver per ton; this, of course, is exceptional, but it shows the high grade of ore found in the mine. From a late working of 12 tons of ore from the Troy Mine, on Lander Hill, a result of $524 per ton was obtained; 1000 lbs. selected from this lot produced bullion to the amount of $1323. According to the last quarterly report of Lander county, it appears that the Manhattan Company during the quarter treated 761 tons of ore, which yielded at the rate of $154 per ton. The New York and Austin Company (Florida Mine) produced 210 tons, yielding $361 per ton; the Great Eastern produced 105 tons, yielding $105 per ton; the Timoke Mine produced 79 tons, yielding at the rate of $222 per ton; the St. Louis Mine (Cortez), 12 tons, yielding at the rate of $399 per ton; the New York Company (Troy Mine), 28 tons, yielding $264 per ton; and the Social and Steptor Company, at Egau Canon, worked 217 tons, which yielded $66 per ton.

Geological change appears to be more rapid, or more obvious, along the coasts of China and Japan, and the country to the northwards, than in other parts of the world. The changes that have taken place within the memory of man are almost incredible. The land is elevated, and gains on the sea. Mr. Bickmore, an American traveller, has made careful observations from Canton up to the mouth of Amoor river, and his general conclusion is that the facts, taken in connexion with the dry beds of friths and bays along the Siberian borders of the Artic Ocean, and the remnant of the old gulf that once washed the eastern flank of the Ural, enable the geologist to form an idea of the large increase of the Asiatic continent within a comparatively recent period.

COST OF PRODUCING IRON IN VARIOUS COUNTRIES.—England, having the largest and most accessible stores of coal and iron ore, can produce a ton of iron with less labour than any other European nation; and hence it will be most profitable to institute the comparison of cost measured by labour, first with Great Britain. In the Cleveland region, which is most favourably situated for the cheap production of iron, the cost of producing a ton of pig-iron is about 40s., which, at the average rate of wages paid around the blast furnaces, is equivalent to 11 days' labour—that is to say, the labour of 11 men for one day. It is possible that in one or two works this may be reduced to 10 or 12 days, but in others it rises from 12 to 13. In the United States the cheapest region for the manufacture of pig-iron, as yet extensively developed, is on the Lehigh river, in the State of Pennsylvania, where, taking coal and ore at the actual cost of mining, pig-iron is produced at an average cost of $24 per ton, which represents, at the present rate of wages, the labour of about 13 days. But when the iron business is established along the great valley which extends from Virginia to Alabama, the labour of bringing the coal and ore together will be considerably less than on the Lehigh river, and it is safe to say that there iron can be made in any required quantity, when the avenues of communication are sufficiently opened, with as little labour, to say the least, as it can be produced in the Cleveland region. In France, Belgium and Prussia, each now requiring a larger expenditure of human labour to produce a ton of iron than is required in England, there are no such possibilities of reduction, because every year their iron ore is becoming more expensive, and the cost of mining coal will increase more rapidly than in England, in consequence of the size and character of the veins.—*Report of Abram S. Hewitt.*

GOLD ON LAKE SUPERIOR.—An auriferous copper location, situated on the west shore of Black Bay, Lake Superior, has recently been examined and reported upon by Prof. Chapman, of Toronto. The vein consists of a gangue of quartz with enclosed portions of wall-rock, and some heavy spar, &c., carrying a very strong lode of intermixed copper pyrites and galena. The vein itself appears to average about 10 ft. in width, but at present it is to a great extent still uncovered. The copper pyrites and galena, although scattered more or less throughout the vein, run principally in a solid lode of at least 4 ft. in width. The course of the vein is about north 65° east, and, so far as this can be determined in the present undeveloped state of the vein, the dip, or underlie is towards the south-west, at an angle of about 80°. Carefully conducted assays show amounts of gold varying per ton from about 14 to 19 dwts., the mean of those already made giving 17 dwts. 12 grs., with 2 ozs. 2 dwts. of silver. These results, obtained it will be understood from surface specimens only, show a value of nearly $21 per ton, irrespective of the large amount of copper and lead also present in the ore. One sample yielded 8·10 and another 11·62 per cent. of copper. The latter is equivalent to 232½ lbs. in the Canadian ton. The amount of lead obtained from one of these samples was equal to 47½ per cent. Professor Chapman recommends that in place of attempting the extraction of gold on the spot the ores should be run down in a reverberatory-furnace into a so-called matt, a fusion-product, consisting of rich sulphides holding all the gold, silver, lead, and copper present in the ore. The excess of galena in these ores, and the abundance of fuel in the district, would enable the process to be easily and cheaply carried out; the matt could be readily sold to the smelters at Swansea. The vein is favourably situated as regards drainage and working conditions. There is ample water and a large amount of good timber suitable for mining purposes. Prof. Chapman considers that the property may be confidently recommended to capitalists as a mineral location of more than ordinary promise.

FOREIGN MINES.

JAVALI.—The report of the manager, and further advices down to May 8, have come to hand. On April 23, two months after being landed at San Ubaldo, the first two batteries of the new Californian machinery, though not yet quite finished off, were set going, in the presence of Mr. J. Alington (one of the directors, just on the point of starting for England), Mr. Bolt, the Chontales commissioner, and many other persons interested in the development of Nicaraguan mines. The general opinion was that the new mill was a creditable piece of workmanship, which, when quite completed, would answer every expectation. The second batch of Californian machinery, consisting of 16 stampers, had also arrived at San Ubaldo; 100 mule-loads of it had already been delivered at the mine when the mail left, and the remainder had started; 10 carts were on the road. All hands were busy in preparing and setting up more additional batteries. The underground workings were steadily progressing. Pollock's tunnel had advanced 16 yards and Pim's 12 yards; 500 tons of excellent ore had been raised at the Socorro. Labour was abundant, and the health of the district excellent. Arrangements had been made for the monthly delivery of cash at the mine, rendering the tedious and expensive journeys of the cashier to the towns on the West Coast unnecessary. It may be added that Mr. J. Alington has just returned to London, after a stay of two months in Chontales, and expresses himself highly satisfied with the value of the Javali property, and its prospects.

UNITED MEXICAN.—Guanuxuato, May 4: The packet has arrived unusually early this month, and the board despatches, dated April 1, were received by me on the evening of May 1. By them I have been much gratified at learning that the agreement made by me for the San Cayetano adit with its owners has met with the board's approbation, and subsequently submitted to, and sanctioned by, the proprietors, at a general meeting held on March 25. No endeavour on my part shall be wanting to push matters forward, but I may not be able to send the copy of the contract by the next English mail. The mine of Jesus Maria looks more promising again, as we have dralned the "planes" (deepest workings), and are at work in the pozo de Guai and two other pozos. In the mines in the Oscura district we are going on but slowly.

RHENISH CONSOLS.—G. Sweet, June 16: Christiana: The driving east on course of the lode, at the 20 lachter level, is still worth 1 ton of lead ore per lachter. The driving west in this level is not so good as when last reported, being now worth 1½ ton of lead ore per lachter. Pittar's sink is communicated with the 20 lachter level; the lode will afford 3 tons of lead ore per lachter. The driving west in the 10 lachter level is at present poor. The stope west of Sweet's winze, in the 10 lachter level, will afford 1½ ton of lead ore per lachter. The stope 10 lachters west of Sweet's winze, in the adit level, is improving, being now worth 2 tons of lead ore per lachter. There is no alteration in the adit forebreast west.—Bliebach: A stope in the roof of the 10 lachter level, on the middle lode, 12 lachters west of the cross-cut, will afford 1 ton of lead ore per lachter. In the cross-cut driving south in the adit level, directly over this stope, we expect to reach the lode in a day or two. All other bargains are the same as last reported.

CAPULA.—Capt. Paull, May 8: On Tuesday last I sent to Mexico, by the Real del Monte Company's conducta, 203 marcs (1624 ozs.) of silver, the produce from 112 cargas of metal beneficiated at San Cayetano hacienda; the cost of beneficio amounted to $37 per monton, including quicksilver, which was not very heavy, about 12 ozs. per marc.—The Mine: I am happy to inform the directors that the barreteros have all gone to work quietly, on tutwork and the tenth part of the metal. The stopes west of San Jorge rise have improved since my last. The other places are without alteration. We have sufficient metal broken for a torta of 10 montons; the carriers have commenced taking it to the hacienda, the silver from which we hope to get in a month; the azoguero reduces the metal now in about three weeks. We hope to be able to send sufficient to the hacienda for two tortas this month. We hope to be able to get the steam-engine to work this month. We are still short of bricks for finishing the stack, but that will not prevent us from going to work. All the masons, carpenters, &c., will be employed after another week about the hacienda. I have sent out some of the ironwork for the wheel, and hope to get the gudgeons in a few days. I do not think we shall require any money from Messrs. Lascurain and Co. in advance. As soon as the Esperanza level is dry, I trust we shall get out sufficient metal not only to pay the expense of the mine, but also for erecting the hacienda. We have not yet resumed the driving of the Esperanza and San Enrique levels, but hope to do so next week

ALAMILLOS.—June 6: The lode in the 4th level, east of La Magdalena shaft, is small, and the ground very hard. The 4th level, west of La Magdalena, produces 1½ ton of ore per fathom; the lode is large and strong, and of a kindly appearance. The 4th level, east of Taylor's engine-shaft, which had been on the south part, is holed by means of a cross-cut north to the above level. The lode in the 5th level, east of Taylor's shaft, is 5 ft. wide, containing stones of tin. The lode in the 5th level, west of Taylor's shaft, is looking very kindly, and is getting easier for driving; it yields ½ ton of ore per fathom. In the 4th level, west of San Andriano shaft, the lode is small and poor. The 3d level, west of San Yago, is not turning out nearly so well as expected. The 2d level, west of Crossby's cross-cut, yields 1 ton per fathom; this is opening fairly productive tribute ground.—Shafts and Winzes: The men are getting on well with Taylor's engine-shaft, sinking below the 5th level, and will put it down to a new level speedily. San Guillermo shaft, below the 1st level, yields 1 ton per fathom; the sinking was interrupted in the course of the past month, but the shaft is again dry. Very good progress has been made in La Magdalena shaft, below the 4th level, and we expect to complete the shaft to the 5th level this month. Barga's winze, below the 3d level, yields ½ ton of ore per fathom; this will reach the requisite depth for the 4th this month. The lode in Perez' winze, below the 2d level, is small, yielding ½ ton of ore per fathom, and the ground is hard for sinking. Alfonzo's winze, below the 2d level, produces 1½ ton of ore per fathom. This sink (in advance of the 3d level, west of San Yago) is going down in a good lode. Gil's winze, which is being sunk on a very fine lode, yields 3 tons per fathom, and Torrento's winze yields 1 ton of ore per fathom; this new winze is situated east of Taylor's shaft, and nearly over the end of the 5th level. The stopes have undergone the ordinary amount of fluctuation during the past month, and are now, on the whole, looking much as usual. Our pumping machinery is in fine condition, and the surface work throughout is going on regularly. We estimate the raising of ore for June at 250 tons.

FORTUNA.—June 6: Canada Incosa: In the 110 fm. level, driving west of O'Shea's engine-shaft, the lode is small and poor. The 110, east of O'Shea's engine-shaft, yields 3 tons of ore per fm.; the lode has greatly improved in the last week. In the 100, west of O'Shea's shaft, the cross-cut is very hard. The lode in the 90, west of Judd's shaft, is very compact, yielding 1½ ton of ore per fm., and is opening good tribute ground. The men are making slow progress in the 80, west of Judd's shaft, lode unproductive. In the cross-cut south in the 80 fm. level the granite is becoming harder. The 70, east of Carr's shaft, yields ½ ton of ore per fm.; the lode has fallen off very much in the past fortnight. The lode in the 55, east of San Tomas shaft, being small and poor, the driving is stopped for the present.—South Lode: The lode in the 40, west of San Pedro shaft, contains stones of lead, but is not opening tribute ground. In the 50, west of San Pedro shaft, the lode is very wide, producing ½ ton of ore per fathom. The 50, east of San Pedro shaft, yields ½ ton of ore per fm.; the lode is very strong, and the ground moderately easy. In Picon's winze, below the 100, the lode, which now yields ½ ton per fm., has failed very much in the past fortnight.—Los Salidos Mine: In the 100, west of Morris's engine-shaft, the ground is very hard, and the lode small and unproductive. In the 65, west of San Carlos shaft, the lode, which is getting very small, yields ½ ton of ore per fathom. In the 100, east of Morris's engine-shaft, the lode is large and disarranged, containing stones of lead occasionally. The 90, east of Cox's shaft, produces 1½ ton per fm.; the lode is divided into branches, and is not on the whole looking so well as it was. The 75, east of San Pablo shaft, yields 3 tons of ore per fm.; the lode is compact, and is opening splendid ore ground.—Shafts and Winzes: Good progress is being made in Buenos Amigos shaft, below the 90 fm. level. The lode in San Gabriel shaft, sinking below the 90, is large, and of a kindly appearance, yielding 2 tons of ore per fm. In Callegon's winze, below the 55 fm. level, the lode is getting smaller. Owing to the preparatory work in hand at Buenos Amigos shaft having hindered some stopes and drivings in its vicinity, we find it rather difficult to keep up our usual rate of raisings. The stopes at work are, on the whole, looking much as usual. The surface work and machinery are going on with their accustomed regularity. We estimate the returns for June at 375 tons.

LINARES.—June 6: West of Engine-shaft: The lode in the 100 fm. level, west of engine-shaft, is easier for driving, and has a promising appearance, yielding ½ ton of ore per fathom. The 75, west of Warne's shaft, produces 1 ton of ore per fathom; the lode has improved in the bottom of the end. The 31, east of San Francisco shaft, yields 1½ ton per fathom; the lode is compact, and is opening a good run of productive tribute ground.—East of Engine-shaft: The lode in the 95, east of Taylor's cross-cut, is very wide, and spotted with lead, yielding 1 ton per fathom. The lode in the 95, east of No. 154 winze, has failed of late. In the 95, west of No. 154 winze, the lode is small, and the ground very hard.—Shafts and Winzes: An excellent month's work has been done in Warne's engine-shaft, sinking below the 75; the lode yields ¼ ton of ore per fathom. San Jose shaft, below the 85, produces ¾ ton per fathom; the lode is kindlier, and contains more ore than it did. In No. 157 winze, below the 61, the lode, which yields ¾ ton per fathom, is failing gradually. The lode in No. 158 winze, below the 85, is strong and moderately productive, producing 1 ton of ore per fathom. In No. 159 winze, below the 31, the lode is very compact, firm, and regular, producing 1 ton of ore per fathom. The stopes on Warne's and the north lode yielded a good quantity of lead in the past month, and are likely to do very well during June. The machinery and all surface works are going on very regularly. We estimate the raisings for the present month at 300 tons.—Quinientos Mine: In Taylor's shaft, below the 30, an excellent party of sumpmen have been put to cut a plat and barrow-road preparatory to sinking to a 45 fm. level. Addis's shaft, sinking below the surface, yields ¾ ton of ore per fathom. We have been very successful in clearing and deepening this shaft, and have reached sound ground in the west end of the shaft this day (the 10th), where the lode is of a very kindly appearance, and we hope in a day or two to get at the bottom of old workings in the whole length of shaft. The water is kept out with the whim easily. The lode in the 30, east of Taylor's engine-shaft, is more regular than it was, and lets out a good deal of water. The 30, west of Taylor's engine-shaft, produces 1½ ton per fathom. In this level the lode is improving, and, although small, is compact, firm, and of a promising appearance.

LAGUNA.—J. R. Rule, Pachuca, April 27: Previously to commencing the sinking of the shaft, I have considered it best to form a level of a vara or two, as they may be found useful hereafter. Towards the east of the shaft, at the depth of 75 varas, about 2·31 varas have been driven, and we shall commence immediately to sink; until this is done there will not be anything to dilate upon.—May 8: The sinking of the shaft was resumed on the 27 ult., and on the 2d inst. the progress made was three-fourths of a vara; and I am happy to be able to state that the vein in the bottom of the shaft appears to be more promising for ore than it was a little above, and some costales of ore of good quality have been picked out from the stuff broken in the three quarters of a vara above mentioned, and in the course of the next two or three weeks we shall see if there is a regular improvement in sinking, or if it is a bunch.

[For remainder of Foreign Mines, see this day's Journal.]

AUSTRALIAN MINES.

YUDANAMUTANA COPPER.—Captain Terrell (April 18) reports:—Blinman Mine, No. 1 Winze: The lode in this place is still looking well, and better than when I wrote my last report. The men have been stoping at the bottom of the winze the whole of the month. All the stuff coming from the lode is fit to go to the furnace; it requires no dressing, and is a beautiful lode of ore. The men are now sinking and stoping, and will be so the remainder of the month.—No. 2 Winze, South End: In driving this end at the 20 fm. level we cut through some good branches of ore; in fact, the whole of the attle which came from the end makes good third-class ore. The nearer we get to No. 1 winze the more ore we shall get. The lode in the stopes in back of the 10 fm. level has improved since my last report; the men are carrying the stope about 12 feet wide and 6 feet high; the whole of the stuff from here is good smelting work. The stopes in back of the 20, Big Bunch, and south of No. 1 shaft, are looking much the same as last report—no alteration. The copper made for the month is 37 tons 18 cwts. 2 qrs., and the whole is dispatched to Port Augusta; my return is not so good as I expected, owing to No. 2 furnace undergoing thorough repair; in fact, nearly re-built. I am pleased to say the mine is looking better than when I last reported, and also to inform you that I have added to pile 100 tons of 16 per cent. ore. Had I been able to smelt this, my return would have exceeded last month's.—Fire-Brick Making: I have another kiln burning; you are aware of our success in this department. A good supply of first-class wood and charcoal coming in. There is also, I am pleased to say, every appearance of a splendid season. Our creeks were all running last week, filling wells, tanks, &c. In conclusion, I am highly gratified with the continued improved appearance of the mine.——The superintendent (April 23) remits draft for 1000*l.*, and concludes his report as follows:—We have now about 4000 tons of wood on hand, and current wood contracts for nearly 10,000 tons. During the past month about 100 tons of good smelting stuff have been put to pile, in addition to what has been passed through the furnaces. The whim and casing of the main shaft are now nearly completed; this, when finished, will reduce the cost of raising considerably, and enable us to put to pile large quantities of ore until the projected additional furnaces are ready for work. On the whole, I am in a position to congratulate the proprietors upon the marked success of our operations during the past nine months, and upon our future prospects.

GREAT NORTHERN COPPER.—Capt Tonkin (April 18) reports:—The winze west of long cross-cut is down 10 fms., and we have a branch or lode come in from the south side; it is underlying north, and running east and west, composed of mundic and decomposed slate. I shall be in a better position to report after cutting through this lode; it looks well. We have driven south 4 or 5 ft. in the winze west of long cross-cut during the week, on a very strong iron gossan lode; we have no mundic in the lode now. I intend driving to intersect the south wall, as the lode may make ore there. I have examined the plan you sent me, and I think we shall met with ore driving west. We are not through the lode in the winze yet.

WORTHING.—Adelaide, April 25: We have again great pleasure in confirming the favourable news sent by recent mails. The 83 fm. level ends both north and south have continued productive, and in good ground. Upwards of 22 fms. of ore ground are opened up for stoping, and the winzes holed through have been sunk through a good paying lode in both cases. The south end in the 83 appears to be in the heart of the big bunch, and making off to the east a great deal further than it did at the 73; it has also changed in character, and more likely to produce large courses of ore. What the width of the lode is we cannot say, but are now stripping the sides of this level, and have it 10 ft. wide, but no signs of either wall. In the 83 fm. level north end there is also a very great change from that in the levels above, where they became poor and hard in driving north about 3 or 4 fms.; but at the 83 we have driven 10 fms. 5½ feet through a good lode, varying from 3 to 8 ft. wide, and still going north; this we are in hopes will bring us up to the bunch we have been wanting to get for so long a time, and if it does we shall soon see better days in the Bremer. The 63 fm. level south end continues to improve, but the ground being hard we cannot go ahead as fast as we should like; but we are fully persuaded there is a good lode before us. We have decided to resume sinking the shaft below the 83 again as quickly as possible, and have put on more men, so as to continue the driving at the same time as the sinking is progressing. From the appearance of the 83 there is the strongest reason to expect a good course of ore in the next level. The quantity of ore raised during the month was 170 tons of the usual quality. Ore on hand, 115 tons; regulus on hand, 3 tons; copper ore shipped, 70 tons. Number of hands employed, 110.

PORT PHILIP AND COLONIAL GOLD.—Mr. Bland, resident director (Clunes, April 23), reports: The quantity of quartz crushed during the four weeks of March was 5106 tons. The total yield of gold was 2326 ozs. 18 dwts., or an average of 9 dwts. 2 grs. per ton. The receipts were 8618*l.*; payments (including 733*l.* paid for firewood and mine timber stock account), 5018*l.* The profit was 3600*l.*, added to which was last month's balance of 1205*l.*, which left an available balance of 4805*l.* The amount divided between the two companies was 4000*l.*, the Port Phillip Company's proportion being 2600*l.* The balance of 805*l.* was carried forward.—Return for first two weeks of April: Quantity of quartz crushed, 2471 tons; total gold obtained, 1076 ozs. 7 dwts.; yield per ton, 8 dwts. 17 grs. Remittances, 2556*l.*

ENGLISH AND AUSTRALIAN COPPER.—Adelaide, April 27: The quantity of coal at Korringa was 827 tons; at Kapunda, 402 tons; and at Port Adelaide 1527 tons. There were four furnaces at work at Port Adelaide, and the furnaces at Kooringa would soon be re-lighted. The 100 tons of copper, advised by last mail as ready to be shipped, have since been shipped.

SCOTTISH AUSTRALIAN.—The directors have received advices from Sydney, dated April 22 last, with reports from Lambton Colliery to the 20th of that month. The sales of coal for the month of March amounted to 14,876 tons. The viewer reports that the works are in very good order. The coal trade continued to be in a satisfactory state, and prices were maintained.

YORKE PENINSULA.—The directors have received advices from the committee of inspection of the company at Adelaide, dated April 25, with reports from the Kurilla Mine to the 23rd of that month. The committee of inspection write that they "have great pleasure in informing you that a decided improvement has this month taken place in the prospects of the Kurilla Mine, as you will see by enclosed copies of letters from Capt. Anthony." Capt. T. Anthony reports—"In my last monthly report, dated the 30th ult., I informed you of having suspended the driving of the 35 fm. level, east of Hall's shaft, and put the men to lay open the north part of the level, with the hope of discovering the main portion of the lode. It is now my duty to inform you that I have succeeded; the lode is 2½ ft. wide, and will yield 1½ ton of ore of 20 per cent. copper per fathom; as regards its general characteristics and what it augurs for deeper sinking, nothing can look better. The presence of black ore (always formed from the decomposition of other ores of copper, and almost invariably overlying sulphurets) indicates still deeper deposits, while the improved character of the lode as you sink deeper is strong presumptive evidence of a good mine in depth. The lode in the winze (sinking from the 25 to the 35) is 4 ft. wide, and is orey throughout, yielding 2 tons per fathom of 15 per cent. ore. I feel it my duty to add that the appearance of the lode, both in the winze and in the 35 fm. level directly below it, and taking into account the ore discovered in the back of the 35 (and still standing) by my predecessor, justify the belief that remunerative deposits of ore exist below, and I could wish that following my advice you would allow me to push on operations more extensively. I hope to raise a fair quantity of ore, considering the number of hands employed, as soon as the winze is holed to the 35, but nothing can be done below the 35 until the shaft is sunk deeper. The question for your consideration is—Does the present state of the lode justify this? I am sure it does, and that more than ordinary chances of success exist. The tributers who were at work in the 15, finding it unremunerative, removed to the back of the 25, east of Hall's, where they are making good wages. The engine and pitwork are in good condition. The ore raised from the 35 and the winze, with the tributers' ore added, will enable me to prepare for sale a small parcel by the end of next month."

Works published at the MINING JOURNAL *office, Fleet-street, Londo*

THE MINERS' ASSOCIATION OF CORNWALL AND DEVONSHIRE. PAPERS ON PRACTICAL MINING. 1s.
JOINT-STOCK COMPANIES, AND HOW TO FORM THEM. By THOMAS TAPPING; 2s. 6d.
TREATISE ON IRON METALLURGY. By S. B. ROGERS. £1 5s.
STATISTICS OF MINING (ANNUAL). By W. H. CUELL. 6d.
"CORNISH NOTES"—NEW SERIES. By J. Y. WATSON, F.G.S. 1s.
RISE AND PROGRESS OF MINING IN DEVONSHIRE. By G. CHOWEN. 1s.
SLATE QUARRIES AS AN INVESTMENT. By J. BOWER. 1s.
VENTILATION OF MINES, FOR THE USE OF UNDERGROUND MANAGERS AND OVERMEN. By RALPH MOORE. 5s.
SECTION OF LANARKSHIRE COAL MEASURES (NEW EDITION). By RALPH MOORE. 10s. 6d.
MINERS' MANUAL OF ARITHMETIC AND SURVEYING. By WILLIAM RICKARD. 10s. 6d.; by post, 11s.

London: Printed by RICHARD MIDDLETON, and published by HENRY ENGLISH (the proprietors), at their offices, 26, FLEET STREET, E.C., where all communications are requested to be addressed.—*June 20, 1868.*